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AUTHOR Atkinson, Roger; Rehn, Geoff
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ABSTRACT

Adoption of new educational technologies usually requires a dissemination strategy as an explicit element in the design of a system. This paper reviews elements in a "student-driven" dissemination strategy for Internet services, based on experiences with "cleo" and "carmen," Internet hosts operated by Murdoch University (Australia). The objective was to offer computer-mediated communications with the greatest scope for student involvement and a collaborative learning approach to Internet services, while also addressing concerns over the cost and organization of access facilities, regulation of user behavior, equitable access for all students in a class, and the need for user training and technical support. The growth of these services necessitated the introduction of some user fees and of modem pools, but growth has also resulted in the allocation of funds for upgrades and enhancements. Implications for teaching and learning applications are summarized, from the concept of "cybercafe" discussions to the use of the World Wide Web and listservers for content delivery. (Contains 17 references.) (Author/AEF)

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A Dissemination Strategy for Student Adoption of Internet Services

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Roger Atkinson and Geoff Rehn
Academic Services Unit, Murdoch University
atkinson@cleo.murdoch.edu.au
rehn@cleo.murdoch.edu.au

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Adoption of new educational technologies usually requires a dissemination strategy as an explicit element in the design of a system. This paper reviews a number of elements in a dissemination strategy for Internet services, based upon our experiences with "cleo" and "carmen", Internet hosts operated by Murdoch University Academic Services Unit. We sought to offer the greatest scope for student involvement and a collaborative learning approach to Internet services, whilst also addressing concerns over the cost and organisation of access facilities, regulation of user behaviour, equitable access for all students in a class, and the need for user training and technical support. We sought a "student driven" adoption of Internet use, a dissemination by popular demand, as a prerequisite and stimulus for future applications in formal teaching and learning.

At times educational technologists encounter critical comment about "technology driven" innovations in teaching and learning. Bowser and Shepherd (1991) expressed this risk in the form of a question, "Are distance education practitioners finding a technology and then inventing an application?". This kind of question weighed heavily upon our planning during late 1992 when our External Studies Unit obtained funding for a project described at the time as the "External student email project". We began by looking for a "student driven" way to introduce computer mediated communications into Murdoch University's distance education delivery.

This paper describes some of our experiences with the idea of a "student driven" adoption of Internet services. When our first host, "cleo" (cleo.murdoch.edu.au) went live in March 1993, it was not at all clear that concepts such as "student driven" and "Internet services" were meaningful, let alone viable. Although staff use of Internet email for research and administrative communications grew rapidly at Murdoch University during 1993-95, the idea of using of email and other kinds of Internet services for teaching and learning purposes attracted little attention. Very few students had access to email and other Internet services. Any attempt to incorporate these into teaching would require unit coordinators to devote an excessive amount of time, effort and very scarce funds towards organising an effective way to overcome that barrier.

In this context, we conceived cleo's primary purpose to be the establishment of "computer mediated communications" as an attractive medium being used voluntarily by an increasing number of students. We knew that we had to overcome the access barrier without recourse to any special effort or major funding by the University. We knew that we had to cope with growth in student demand and with organisational change. In February 1996 cleo was joined by our second host, "carmen" (carmen.murdoch.edu.au), and we are part of the Academic Services Unit which succeeded External Studies in May 1995.

Cleo's principle objective did not change during 1993-96, except that it is now shared with carmen. The principle objective is "to attract sustained attention to and use of computer mediated communications for education and information purposes by developing a viable base of modem users and a range of attractive services" (Atkinson and Rehn, 1995).

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Modem communications

Cleo's operations tackled the creation of a "viable base of modem users" because Murdoch University lacks on campus facilities for student access to email and other Internet services. This feature of our context is unlikely to change significantly until late 1996 or 1997, although on campus access to Internet services via cleo and carmen has been trailed for some students, notably with several Law School classes in a CAUT Project and a group of international students (Atkinson, 1995i). When on campus workstations are not available, developing a user base amongst undergraduate and graduate coursework students depends very much upon modem communications, for which students purchase and house at home their own personal computer and modem, and provide their own telephone line.

Unfortunately, modem communications are not undertaken easily. Apart from the expense of a modem, usually in the range $140 to $500, it is often quite a demanding matter to install and learn how to use it effectively and efficiently. The University has to provide the modems and telephone lines which answer a user's modem call, a host computer and the local area networking infrastructure, though these are now relatively economical aspects. User training and support services, host management, fund raising and other tasks have to be undertaken.

However, there are certain advantages for modem communications. Typically, a student's home is also his or her personal work space, favoured by a sense of ownership and control which is usually not attained with communal facilities in classrooms, laboratories and libraries on the campus. Connecting users via a modem pool does not entail the rather large expenses and maintenance work associated with providing laboratories filled with personal computers for on campus use by students. Also, in Murdoch University's context, modem communications offered an avenue for rapid growth. This we attained by giving cleo and carmen accounts to on campus students and we did not restrict ourselves to external student services only. On campus students are eligible if they have their own home based personal computer and modem.

How we developed attractive services

The overall strategy for obtaining "sustained attention" and "a viable base of modem users" is to develop attractive services. We sought the broadest possible basis for this strategy, including the features summarised in this list:

- Offering users full access to the Internet. The wider the range of services and purposes offered, the greater is the probability in favour of successful commencement and continuing, effective use (Atkinson, 1995a). However, this approach may be criticised by those who feel that it allows excessive use for social and recreational purposes in contrast to academic purposes.
- Attractive local services from cleo and carmen's web servers, majordomo listservers, ftp servers, pop servers (for Eudora and other email agents), slip emulation, irc clients and other services, plus access to the University's Internet newsgroups host "newsman" (Atkinson, 1995b).
- Facilitating access from computers at home via modems, by enabling the use of graphical interface software for Internet services (Atkinson, 1995c). Supportive induction for new users, including individualised assistance for initial technical problems (Atkinson, 1995d).
- Avoiding extrinsic pressures to learn at a specified rate. Users do not have to learn how to use the technology in time to meet assignment submission deadlines and examination schedules for study in specific units. However, this approach may be criticised by those who feel that it places excessive reliance upon extra-curricular learning, in contrast to the usual procedures for structuring university study into formally assessed units.
- Avenues for group communications on technical matters in using computers, for the dual purposes of providing user support for novices, and giving experienced users a forum for helping and teaching other users and for contributing towards enhancement of the system. Our main avenue is the emailing list "eff_one@cleo" run by cleo's majordomo listserver (Atkinson, 1995e). Eff_one provides a very substantial supplement to the user support services available for cleo users.

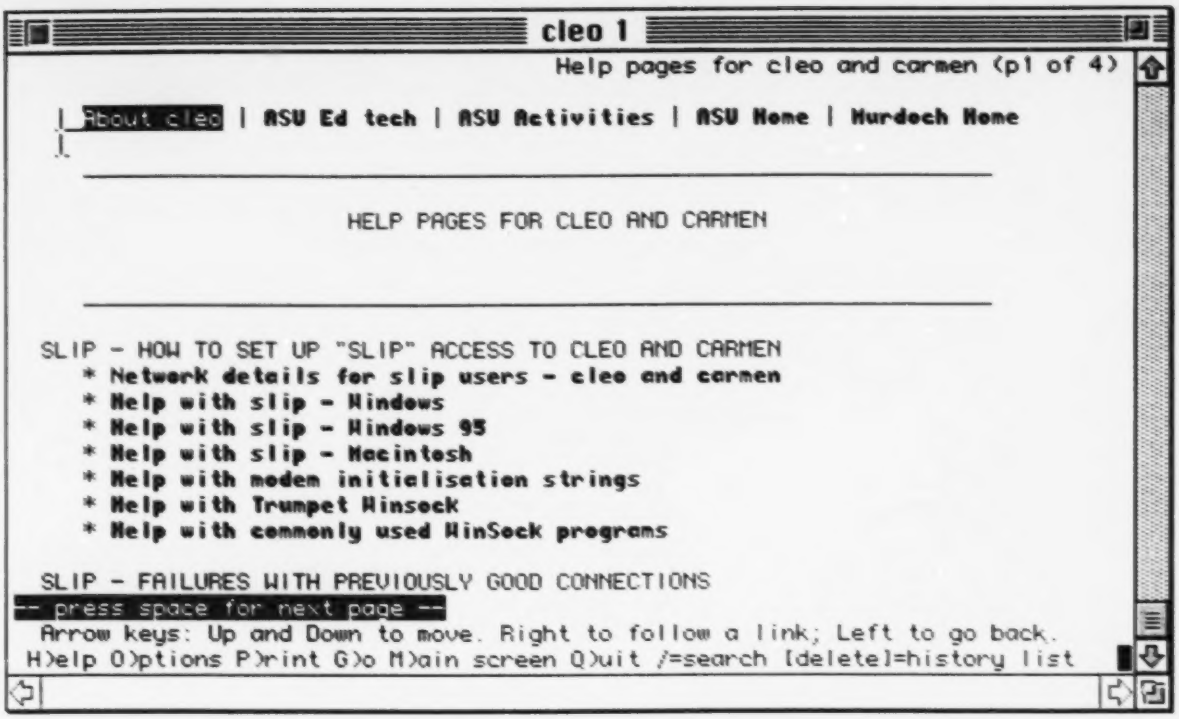
cleo 1
Help pages for cleo and carmen (p1 of 4)
About cleo | ASU Ed tech | ASU Activities | ASU Home | Murdoch Home
HELP PAGES FOR CLEO AND CARMEN
SLIP - HOW TO SET UP "SLIP" ACCESS TO CLEO AND CARMEN
* Network details for slip users - cleo and carmen
* Help with slip - Windows
* Help with slip - Windows 95
* Help with slip - Macintosh
* Help with modem initialisation strings
* Help with Trumpet Winsock
* Help with commonly used WinSock programs
SLIP - FAILURES WITH PREVIOUSLY GOOD CONNECTIONS
-- press space for next page --
Arrow keys: Up and Down to move. Right to follow a link; Left to go back.
H)elp O)ptions P)rint G)o M)ain screen Q)uit /=search [delete]=history list

Figure 1. Many users commence with serial communications, which enables them to read online documentation (accessed via the command "help" at the host prompt). This help page presented via lynx, a web reader for Unix, is to help users upgrade to slip communications.

- Avenues for purposeful communications relating to immediate, study oriented activities, such as access to the University CWIS, the Library's catalogue system, email to tutors, and experimental investigation of assignment submission by email.
- Avenues for group communications relating to the University's intellectual and social environment. For this purpose cleo runs the list "bushcourt@cleo" for student comments and debate on contemporary issues concerning the University community (Atkinson, 1995e). The list "telegraph@cleo" is run for geographically remote students.
- A substantial and growing user base, in terms of numbers of users and their level of activity. Accounts on cleo or carmen are available for both external and internal students, from any of Murdoch's Schools. The "liveliness" created by the users of a host attracts increased participation, for example users own web pages (Atkinson, 1995f) and community access (Atkinson, 1995g) are encouraged on cleo.
- Users in control of their own purposes and assured of a participatory role in shaping the purposes and management of their host. Issues include reasonable implementations of user charges satisfying both University and users, access to a full range of Internet services, privacy rights, freedom of expression rights, and the ethical conduct of communications and publishing activities (Atkinson, 1995h).
- Securing additional funding to cater for growth and operational expenses. Cleo's main external grant was from the Committee for Advancement of University Teaching (CAUT) for the 1994 project "Collaborative learning through computer conferencing" (Atkinson, 1995i). User charges now contribute a substantial part of cleo and carmen's funding (Atkinson, 1995j). From late 1996 additional funds became available through Academic Services Unit salary savings and the University's NPRF 96 Project (Atkinson, 1995k).

Outcomes from cleo operations

The number of student users of cleo grew rapidly during 1994 and 1995, until cleo growth was placed "on hold" by the University's Information Technology Policy Committee (ITPC) in mid 1995:

Feb94	Jun94	Mar95	Sep95	Dec95	Mar96
45	308	459	607	541	837 (including carmen)

The pause in cleo growth in mid to late 1995 was due to concern over cleo users taking a dominating share of the capacity of the University's modem pool. Critics were not impressed by the argument that cleo had averted concerns about the modem pool being a "white elephant". There was uncertainty about the impact of traffic volume charges which were introduced for AARNet members in 1995, and a view that development of University policies on Internet access for students should not be pre-empted by the rapid growth in cleo's operations as the only provider.

However, after a period of declining numbers and an extensive deletion of inactive users and users who had left the University, the main uncertainties have been overcome by a series of actions and events which opened the scope for a resumption of growth. These include:

- Introduction of user charge for cleo and carmen users (Atkinson, 1995j). Current levels are $25 per six months for student users, and $45 per six months for community users (our community users, mainly school teachers and librarians, are differentiated from student users). Income is used for modem pool expenses, traffic volume charges and minor maintenance. It is not a full cost recovery charge, because staffing for cleo and carmen operations and hardware depreciation are not covered.
- Creation of a "cleo only" modem pool, which countered the criticism that cleo users were "hogging all the modems" and preventing staff users from obtaining connections. Capacity for the cleo and carmen only pool is leased from Computer and Network Services Unit under a full cost recovery charge, currently $590 per port per year.
- A strong defence of cleo's role and strategies by cleo's users. Ironically, the threat that cleo would be forced into a negative growth phase turned out to be a stimulus for increased student utilisation of Internet services. For example, the new list "bushcourt@cleo", set up initially to discuss user charges and "how to run cleo", attained viability very quickly and at this point in time is the major avenue for electronic debates and consensus formation on topical issues concerning the Murdoch University community. There is no comparable service for staff.
- At the end of 1995 ASU funds from salary savings became available for a hardware upgrade costing $14,000 (Atkinson, 1995j). After porting cleo to the new hardware and stabilising operations under Solaris 2.5, the most recent version of Sun's Unix, the old hardware was brought up again within a few weeks as carmen, also under Solaris 2.5. Running as a "team", cleo and carmen can support up to 2,000 users, whilst still reserving adequate capacity for a heavy load in web serving and listserving.
- The resumption of growth during the summer of 1995-96 was backed also by funds becoming available from the Internet access module and other modules in the University's NPRF 96 Project, "Innovative delivery methods for Murdoch University's South West Campuses" (Atkinson, 1995k). Other vital factors are a healthy position in the user charges budget, continuing enhancements in user support documentation and techniques, a downward trend in the prices of modems, a resurgence in the level of inquiries for first time Internet access via carmen, improved procedures for induction of new users, improved system reliability including an uninterruptible power supply, support from student organisations, successful addition of Windows 95 users, and confidence in a "user driven" approach to future introductions of teaching and learning applications based upon world wide web and email list services.

In 1994-95 an estimated 6 — 8% of Murdoch's undergraduate and graduate coursework students (500 to 600) obtained some experience of Internet access via cleo using modem connections, and a further 1 — 2% (about 100 students) obtained experience via private providers or employers. About 130 law students obtained Internet communications experience via the Law School computer

laboratory and cleo. About 30 of these used modem access to cleo from home in addition to on campus access.

By March 1996 cleo and carmen passed 10% "market penetration" in Murdoch's student population. As the University's Computing and Network Services Unit and several Schools put up hosts later in 1996, linked with workstations for on campus access by students, we can look forward to a University aggregate figure near 25% by the end of 1996. This will do much to overcome the local perception that Murdoch has fallen behind other Western Australian universities in Internet access as an area of student services.

The ultimate extent to which Murdoch students will provide their own home based equipment for Internet access via cleo and carmen or other hosts is uncertain, but 40% by the end of 1997 could be a realistic forward estimate. The extent to which this growth will be spread equitably over the University's entire student population is also uncertain. The principal area of difficulty is off campus, geographically remote students who do not have low cost Internet connections available. Students in cities other than Perth are not a problem, for the ADEnet Project meets their needs for low cost access (Atkinson, 1995l). Some remote students have tried Open Net at $9 per hour, but local providers or STD calls to cleo and carmen are the dominant solutions favoured on the basis of lower costs. Another area of concern, also impacting mainly upon off campus students, is that students who experience difficulty in access to user training programs for information technology skills will be disadvantaged, just as those who do not acquire language, literacy, numeracy and library skills are disadvantaged in tertiary study. However, concerns about under representation of women users have receded, for we now approach 40% women in cleo and carmen's user base.

Regulation of user behaviour is not a major issue amongst cleo and carmen users, although some staff appear to be fearful of the risk that student actions on the Internet may lead to criticism of the University. Cleo has an extensive record of freedom from significant incidents in the contentious areas of content regulation, hacking and copyright. Cleo and carmen user interest in "objectionable materials" is at a level similar to that found on Internet hosts generally. In line with the Internet community at large, bushcourt@cleo debaters are very much opposed to the simple blanket forms of censorship sought by some sections of society.

Cleo and carmen's strategy of promoting student adoption of Internet services by "attracting sustained attention" and a "viable base of modem users" attained maturity, and a sustainable momentum, by the summer of 1995-96. It is now time to increase the effort towards the next phase of growth, which is in the carriage of teaching and learning applications. The final section of this paper examines some implications and give suggestions on how to broaden out from the user base secured during 1993-96.

Some implications for teaching and learning applications

In developing teaching and learning uses of computer mediated communications, we need to aim for the same kind of "natural" ease of use and familiarity which we associate with using lectures, tutorials, books, the University Library, and face to face communications with students. Whilst cleo and carmen's user base demonstrates some modest progress towards that goal, in spite of difficult circumstances in technical and resource aspects, the next major step in bringing computer communications into the "mainstream" will depend to a large extent upon the University's introduction of on campus facilities.

Student adoption of on campus access to Internet services is likely to be enhanced by offering a wide choice of environments. These may include traditional "computer laboratories", Netscape workstations in the Library environment, workstations in a "coffee shop" or "cybercafe" environment, and workstations in Student Village (the University's student housing). Experience with international students at Murdoch through the Council for International Educational Exchange, Institute for Study Abroad and other schemes who became users of cleo for their one or two semester visits gives some indications. Small, informal rooms each with a relatively small, socially coherent group of users are likely to be favoured by students. Two main variations are envisaged, "quiet" environments in the Library or within School Buildings, and "social" environments in School Buildings or other locations such as the Guild of Students in the University's Amenities Building.

If modem access is complemented by on campus access from a variety of environments and with full access to Internet services, we will meet one essential prerequisite for teaching and learning applications. This is a very extensive student user base, familiar and at ease with computer communicated "reading" and "discussion", and ready to enrol in units which feature obligatory use of Internet services. The second essential prerequisite is a body of staff who are also familiar and at ease with teaching via Internet services. In this aspect the development strategy promulgated by the Academic Services Unit is to build up a relatively simple infrastructure for delivery, comprising world wide web server and listserver.

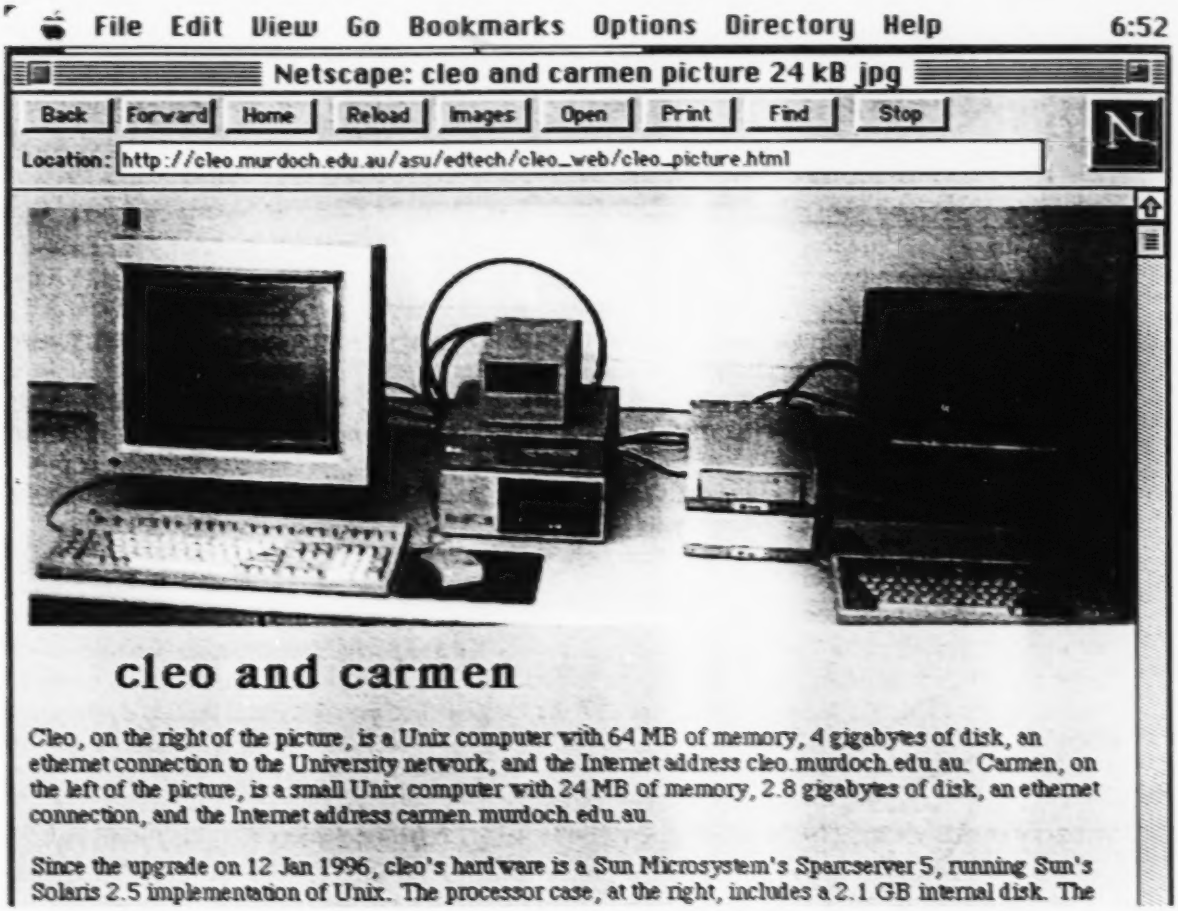
File Edit View Go Bookmarks Options Directory Help 6:52
Netscape: cleo and carmen picture 24 kB jpg
Back Forward Home Reload Images Open Print Find Stop
Location: http://cleo.murdoch.edu.au/asu/edtech/cleo_web/cleo_picture.html
cleo and carmen
Cleo, on the right of the picture, is a Unix computer with 64 MB of memory, 4 gigabytes of disk, an ethernet connection to the University network, and the Internet address cleo.murdoch.edu.au. Carmen, on the left of the picture, is a small Unix computer with 24 MB of memory, 2.8 gigabytes of disk, an ethernet connection, and the Internet address carmen.murdoch.edu.au.
Since the upgrade on 12 Jan 1996, cleo's hardware is a Sun Microsystem's Sparcserver 5, running Sun's Solaris 2.5 implementation of Unix. The processor case, at the right, includes a 2.1 GB internal disk. The

Figure 2. Netscape web reader view of cleo and carmen's statement on hardware (only the first two lines of text are visible). This picture occupies only 24 kB of disk space on cleo, only about one eighth of the file size required for word processor handling of the image. It was taken with an Apple QuickTake digital camera and normally would never be viewed via a paper print.

World wide web and listserver delivery of teaching and learning activities have a number of advantages compared with more complex forms of computer assisted learning. A web server provides a form of "lecture presentation", which is complemented by an email listserver providing a form of "tutorial group discussion". Our initial experiments in "tandem" operation of web pages and emailing list are very encouraging. These are in progress in several directions, including the list edtech-aus@cleo and web pages http://cleo.murdoch.edu.au/aset for Australian Society for Educational Technology, the list trdev-aus@cleo and web pages http://cleo.murdoch.edu.au/trdev-aus for the TAFE, vocational education and training sector, and some electronic journal developments. Initial

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experiments with Murdoch University units supported by web pages and emailing list will develop during 1996-97, in particular those associated with the University's NPRF 96 Project for innovative delivery to branch campuses.

Designing units for delivery support via world wide web pages and an emailing list is simplified through enabling relative ease of use by unit coordinators and tutors, compared with the greater complexities associated with authoring tools for interactive multimedia resources. For email, the typical tools are one's word processor and an email handler such as the widely used public domain program "Eudora". Web page writing is more complex than email, but support services and training courses are available locally (Rehn, 1995). Colour photographs are readily incorporated into web pages (Figure 2).

By using standard Internet services such as world wide web and email, infrastructure developers avoid the very large investments of resources required to produce alternatives. Furthermore, it would be rather pointless to embark upon some kinds of developments, for example an email system specifically for teaching purposes, when great tools are readily available from the public domain (all of cleo and carmen's listserver software and associated Unix utilities are free from the Internet).

It isn't usually possible to test a range of hypotheses when introducing a new educational technology such as Internet communications. In general, owing to the shortage of resources, the best that we can do is can do is proceed with one hypothesis. In our context, we believe that we guessed well with our approach, "student driven" and "dissemination by popular demand". The main alternative to this is pilots focussed upon specific groups, such as one or two distance education units (for example, Boyd et al, 1996). Fortunately, CAUT support enabled us to conduct a major pilot which achieved a very gratifying complementarity (Atkinson, (1995i). This is the Law School's unit Legal Practice and Documentation, coordinated by CAUT Project partner Archie Zariski. Knowing the difficulties associated with attempts to attain 100% uptake by off campus students, we ran with this on campus pilot instead.

Strategies for introducing Internet services into teaching and learning are likely to vary widely between different universities, depending upon context factors such as allocation of funds, extent of dual mode teaching, nature of the student population, staff experience with new technologies and many others. The details of our experience with cleo and carmen may have only marginal relevance in other universities, but we hope that the principles expressed by the phrases "student driven" and "dissemination by popular demand" will be considered widely.

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Note on references: In the world wide web version of this paper:
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the URLs given below are replaced by in text html links.

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Authors: Roger Atkinson, Senior Lecturer in Educational Technology, and Geoff Rehn, Lecturer in Educational Technology, Academic Services Unit, Murdoch University, Murdoch WA 6150, Australia. Voice +61 9 360 6840 fax +61 9 310 4929 Email: atkinson@cleo.murdoch.edu.au, rehn@cleo.murdoch.edu.au Listservers: majordomo@cleo.murdoch.edu.au, majordomo@carmen.murdoch.edu.au Web servers: http://cleo.murdoch.edu.au/ and http://carmen.murdoch.edu.au